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Supreme Court of the United States

October Term, 1948

Nos. 7, 8 and 48

THOGER GRONBERG JUNGERSEN,

Petitioner-Respondent,

v.

OSTBY AND BARTON COMPANY, *et al.*,

Respondents-Petitioners,

and

THOGER GRONBERG JUNGERSEN,

Petitioner,

v.

ROBERT BADEN, ROSE BADEN, ALBERT FOSS, *et al.*, etc.,

Respondents.

BRIEF FOR JUNGERSEN

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New York, N. Y.
October 15, 1948.

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I. Despite a long-felt want which had existed unsatisfied for many, many years, Jungersen's method in its entirety had never been assembled before. Its production by him was a substantial —even revolutionary—technical innovation, for which society is truly indebted to him. The test of history, as it appears from the record, conclusively proves that Jungersen's forward step was not obvious; that it did require more ingenuity than the work of a mechanic skilled in the art. 25

II. The broader claims 5 and 6 can be and should be so construed as to embrace but not to extend beyond what Jungersen truly invented; the new method specifically described when practiced with the substitution of known equivalents for some of the steps particularly defined in narrower terms in claims 1 to 4 36

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BRIEF FOR JUNGERSEN

The question for adjudication is the validity of Jungersen's patent No. 2,118,468, granted May 24, 1938, for a Method of Casting Articles of Intricate Design and a Product Thereof.

The patent has six claims. As to claims 1 to 4 inclusive, the single question is whether the method defined in them is a patentable innovation. In claims 5 and 6, the claimed monopoly is stated in somewhat broader terms. If Junger-

sen's method is a patentable invention, then the question arises whether claims 5 and 6 can and should be interpreted to embrace that invention (including recognized equivalents) and nothing more; and whether certain of the alleged infringing operations are within the monopoly of claims 5 and 6 so interpreted.

Three writs of certiorari (Cases 7, 8 and 48) issued because of conflict in decisions of the Third Circuit Court of Appeals and of the Second Circuit Court of Appeals.

Two writs (Cases 7 and 8) issued to the Third Circuit Court of Appeals which affirmed in a *per curiam* opinion (378a*; 163 F. 2d 312, Case 3) the decision of the New Jersey District Court (Meaney, D. J., 65 F. Supp. 653; 22a) holding claims 1 to 4 valid and claims 5 and 6 invalid because anticipated by Kralund patent No. 1,238,789. The writ in No. 7 was issued on the petition of the patentee Jungersen for a review of the holding of invalidity of claims 5 and 6. In No. 8, the writ issued on petition of Ostby and Barton Co. and American Associates, Inc., seeking review of the decision that claims 1 to 4 are valid.

In case No. 48, the writ issued to the Second Circuit Court of Appeals on the petition of the patentee Jungersen for review of a holding of invalidity of all the claims of the patent. The District Court for the Southern District of New York (Rifkind, J., 26-39; 39 F. Supp. 922) held the patent invalid as a whole for want of invention. The Court of Appeals for the Second Circuit (Judges L. Hand,

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* In cases 7 and 8, Volume I of the record, containing all but the prior patents and publications put in evidence, has its page numbers followed by the small letter *a*. Reference to that volume will be indicated as follows: — (26a). In No. 48 there is but one volume and references to that record will be by simple page number as: — (26). The prior patents and publications put in evidence are the same in both cases and appear only in Volume II of the record in Cases Nos. 7-8. Here also the page numbers are followed by the small letter *a*. Reference will be by the volume and page number as: — (II, 400a).

Augustus Hand and Clark) affirmed by a divided court. There was a majority opinion written by Judge Clark and a vigorous dissent by Judge Learned Hand (210-219; 166 F. 2d 807).

Jurisdiction of this Court is invoked under Section 240(a) of the Judicial Code as amended by the Act of February 13, 1935 (28 U. S. Code, Sec. 347a).

Statement of the Case

The Parties

Jungersen, the petitioner in Nos. 7 and 48, is the patentee and sole owner of the patent in suit.

The respondents in No. 7 and petitioners in No. 8 are Ostby and Barton Company, a long established firm of jewelry manufacturers (353a, f. 1058) manufacturing principally gold and silver rings (355a, f. 1063), and American Associates, Inc., which subsequent to the bringing of the suit was added as a party on its showing that it had acquired all the assets of Ostby and Barton Co. (22a, f. 66)*.

In No. 48, the respondents, Baden, Foss, *et al.*, are a partnership engaged in jewelry manufacture. After issue was joined, seven corporations and fifteen individuals comprising six partnerships were allowed to intervene (43, Finding 1). The intervenors are jewelry manufacturers and the stated justification for the intervention was that "by mutual agreement among themselves and with defendants, intervenors have openly participated in and contributed to the defense of this suit, to the knowledge of plaintiff" (18, f. 54).

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* On appeal an Ostby and Barton Company was added as a party appellant (376a) on its showing that it had acquired all the assets of the Ostby & Barton division of American Associates, Inc.

The jewelry manufacturing art prior to Jungersen

The method described and claimed in Jungersen's patent has to do with "the casting of small metal articles, particularly articles of intricate detail such as jewelry which frequently are designed with hollows, undercut portions and perforations" (185/1/2-5)* to achieve "the formation of intricate castings which will so closely resemble the original and finished product that the slow and tedious work of patterning and detail cutting required in connection with present casting methods is eliminated" (185/1/11-15).

Prior to 1934, when Jungersen made his method available to the public, such articles of intricate detail had been produced (a) by handcraft of skilled artisans or (b) by die stamping where the number of articles to be produced was large enough to warrant the high initial cost of stamping dies, or (c) where the number of articles to be produced was insufficient to justify the high initial expense, by one or another of two casting methods: (1) cuttle-fish casting and (2) sand casting.

> "Prior to the Jungersen patent disclosure, the only known and generally practiced processes in the jewelry casting art were the 'Cuttle fish' and 'sand' casting methods. Neither method was efficient and admittedly each was inferior to the method disclosed in the patent in suit. Under these prior methods the castings were without detail and required extensive hand tooling and chasing by a master artisan, thus greatly increasing the cost of the completed article. The Jungersen method reduces to a minimum the necessary hand finishing of the cast article and makes possible the reproduction in any desired number of

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* The numerals after inclined bars refer to the column and line number in patents.

exact replicas of the original model.". (Meaney opinion, 24a, f. 71; and see Findings 13 and 14, 34a-35a, ff. 101-103. Cf. also opinion of Judge Rifkind, 29-30, ff. 87-90; and 45, Finding 4.)

The making of rings and such like articles of jewelry of intricate design by handcraft of skilled artisans needs no description. It comes down to us from prehistoric times. We adopt Judge Rifkind's description of die stamping, cuttle fish casting and sand casting as follows (30, ff. 88-89):

"4. Die stamping, which consists of stamping out the ring or parts of it by means of metal dies. This process is very efficient. It is still in extensive use when numerous castings of a single design are desired. Its initial cost is high. The dies for a single ring-design cost from $250 to $2,000."

"2. Cuttlefish casting, which consists of compressing the model of the ring to be reproduced between two loaves of cuttlefish bone. The yielding surfaces of the bone form a cavity roughly corresponding to the form of the compressed model. A channel or opening between the two loaves permits the molten gold to flow into this cavity, to form a rough replica of the model. This casting is then hand-finished.

"3. Sand casting, which consists of imbedding the model in a sand frame which, upon the removal of the model, leaves a cavity into which the molten metal is admitted by an opening provided for the purpose. Its advantage over cuttlefish casting is that it permits the production of six to twelve castings from a single mould. The casting is rough and requires hand finishing."

These were the established practices and limitations in making small articles of jewelry of intricate detail such as rings, brooches and the like when Jungersen came into the picture.

The story of the Jungersen invention

Mr. Jungersen is a naturalized citizen, born in Denmark. He had been an automobile dealer, a consulting engineer and a manufacturer in Denmark of Diesel engines, gasoline engines, highway reflectors, and pumps for fire engines, and was an inventor and patentee. He had not been connected with the jewelry business in any way. In December 1933 he was living in Toronto and made a wager with a friend that he could "take any job that he could pick out of a newspaper." They took a newspaper and picked out a jeweler who was advertising for a caster and Jungersen applied for the job and was refused because he was not a jeweler, but he procured from the jeweler one of the most intricate patterns he had in order that he might see if he could produce a finished reproduction to the jeweler's satisfaction. He made the reproduction, took it back to the jeweler and got a job for himself and also for his friend (75-77 and 74a-76a).

In both records Jungersen describes how he proceeded to cast an exact reproduction of that intricate pattern (77-78; 77a-78a). He says he studied the pattern very carefully and thought over how to proceed. He considered sand casting but discarded that thought. He then thought about "making a wax pattern and then melting the wax pattern out" as dentists do—the dentists' application of the ancient "lost wax" process (see post p. 17). As to how to make the mold, he first thought of using plaster of Paris, but put that aside. He then thought of using rubber for the mold. He went into a service station on his way home and bought some strips of patching rubber used for repairing automobile tires. He went home and

built of wood a recessed frame for the mold and then, he says:

"I cut slices of the thin rubber—it was approximately a sixteenth of an inch thick—cut that in a small piece and built them up around the piece of jewelry I had; and then I squeezed it between the two slabs of wood and inside the frame that I had made out of wood, and then I squeezed it with a little clamp and put it into a baking oven, regular in the kitchen, and I baked the mould for a long time until it was cured. I took it out several times, I remember, to punch in and see if it was cured, but as far as I recollect now it took an hour or two before the heat had penetrated into the center and cured the rubber. Well, after I had the rubber mould of this piece of jewelry, then the problem was to fill it. I poured some wax into the opening. That was an open mould, if I could express it that way, just like a flat piece of rubber with a design of the pendant on the one side. That was on one side. Then I poured the wax in there and most just stuck to the mould. I didn't get far with it.

"Then I tried to squeeze it down with my fingers and with a backing first of plaster of Paris, later of a piece of type metal, and that didn't work. I got fins all over it and I couldn't get the patterns out.

"Then I came to think about, well, if I pour the wax in from one end, if I could fill it that way, and I tried, and the wax did not fill the piece all the way down. Some place it filled fairly good, and some place it did not fill at all. Some place there was a very poor impression, like there were on those pictures on that exhibit.

"Then I discarded that. I took a cloth hanger from approximately an eighth of an inch thick steel.

"Q. A coat hanger? A. Yes, one of these regular coat hangers.

"Q. Yes, all right. A coat hanger. A. A coat hanger, and I made a little swing out of it and I took it so I could swing it with centrifugal force, and then I took an old tin can and made myself a little crucible out of this tin can and pointed the nozzle of the crucible into my mould. Then I melted some wax and poured it into my little crucible and swung it around, and that filled the mould with the finest interior that you could ever wish. Then it was just a question of some of it may be a little too hot and some of it may be a little too cold, and after you try it two or three times, then you get them perfect" (77a, ff. 231-78a, f. 234).

After he had produced the wax-pattern in that way he went to "a mechanical dentist * * * one who had been casting for different dentists in Toronto" who was "very much interested. It turned out that this gentleman had been a jeweler before, and he was most surprised to see what I was doing, and he said that I could use his shop, and I did." In the dentist's shop he made his first casting in metal and took it down to the jeweler. "I went back to Mr. Fremes and showed him the casting, and then he said it was one of the finest castings he had ever seen, or the finest" (78, ff. 233-4). He proceeded to work at this jewelry place "to develop it further and make it a well workable process" (79a, f. 237) and took out patents in Canada, the United States, Great Britain, and many other countries. He eventually sold the Canadian patent for $5,000 (82a, ff. 245-246) and went on with the exploitation of his patents in other countries, selling licenses in the United States, England, Sweden, Norway, Finland, Germany, France, Belgium, Australia, India, Brazil, Argentina, Java, etc. He issued somewhere between sixty and seventy licenses in the United States (80, f. 238; 81, f. 242;

82, f. 244). From 1938 to October 16, 1945 "approximately $120,000" in royalties were collected of which $10,250 was from foreign licenses (Werner, 107a).

The Jungersen Patent

Jungersen's method, as described and claimed in his patent (185-187), is a series of six process steps in ordered sequence, as follows (185/1/28-2/54):

1. Producing a model of the piece of jewelry or other small article "in wood, metal or other suitable material, and this may have undercut surfaces, hollows or perforations of any desirable kind" (185/1/30-32).

2. Producing a primary mold by building up around the model a flexible mold-forming material such as rubber, and then vulcanizing to cause the rubber "to flow intimately about the detail structure of the model and thus assumes a permanent shape having a cavity the exact shape and detail of the model embedded therein" (185/1/52-55), the flexible nature of the rubber permitting withdrawal from hollows, undercut portions and perforations (185/2/29-31).

3. Producing any desired number of dispensable patterns (replicas of the model) "of a very low temperature fusing material which may be wax or a metallic alloy such as Wood's metal" which is melted and forced into the primary mold by centrifugal action. The melted wax or like material "is poured into the gate and the mold is rotated rapidly in the centrifugal casting machine. The wax or metal is thus forced into the mould and by the centrifugal action displaces the air within the mould, the molten material congealing first against the exposed surfaces of the cavity formed in the mould and any air which may be trapped in a recess of the mould will be crowded back into the fluid body under the pressure applied thereto and the fluid material will advance into the recess as it crowds the

air therefrom and will progressively congeal against the wall of the recess until the extreme limit is reached so that the finest of cavities will be completely filled. It is essential that the air be expelled from the mould progressively as the molten material flows in so that all interstices whether undercut or otherwise, are completely filled" (185/2/5-25).

4. Producing any desirable number of secondary casting molds by pouring around the dispensable patterns a fluid mixture of water and a mold-forming investment material such as plaster of Paris (185/2/33-40, and 186/1/1-10).

5. Drying and hardening the investments by heat to melt the wax or other material of which the temporary patterns are made and all traces of the wax are completely removed from the mold (185/2/44-47).

6. Casting the final products in any desired number by projecting the molten metal "under applied force into the fine recesses preferably by the centrifugal action." Finally, the mould is separated from the casting (185/2/48-54).

The final result is, as the patentee says, a cast article "which is the exact replica of the original model. It will be readily understood that once the original flexible mould is made any desirable number of the patterns of fusible material may be produced to be invested in metal-receiving material to form moulds and any desirable number of metal casting moulds may thus be produced from the same model. All will be equally accurate and as the final moulds is a complete investment of the wax or other fusible pattern, there will be a minimum of irregularities to be removed. The ultimate result is that metal castings of rings, brooches and many pieces of jewelry which are frequently very fine and intricate may be produced at the very minimum of cost" (185/2/55-186/1/15).

The patent specification then contrasts the labor and cost of his process with (1) the previously-known processes of casting rings (186/1/15-30) and (2) the known die-stamping process (186/1/31-50).

The effect of Jungersen's method on jewelry manufacture

That the Jungersen method is far superior to either cuttle fish casting or sand casting and has practically superseded those former processes is the concurrent finding of the courts below; and the evidence is that in so superseding the old casting processes the new method, because of its economies and its capability of reproducing designs of greater intricacy, encroached even upon die stamping, and furthermore made possible the manufacture of fine and intricate articles that theretofore could be produced only by the handwork of master craftsman, if at all (119-120; 120a, 122a, 123a, f. 368).

We have noted on page 2 above what Judge Meaney said in the New Jersey case about the old casting process and Jungersen's improvement. He also said (25a, f. 75):

> "It was not until Jungersen added the additional step of casting the wax pattern in the primary mould by the use of centrifugal force, that jewelry casting became a practically and commercially successful art."

and he found (Findings 14, 15, 35a; Finding 27, 37a):

> "14. The Jungersen process is admitted to be far superior to either 'cuttle-fish' casting or to 'sand' casting.
>
> "15. The Jungersen method of casting reproduces intricate pieces having undercuts, hollows and perforations without loss of detail and in exact duplication in any number, and reduces to an absolute minimum the skilled labor necessary to a finished product.

"27. Demonstration and commercial success attest to the success of the Jungersen method of jewelry casting. Such methods, resulting in the reproduction to the finest detail of intricate pieces of jewelry, are the first to be completely satisfactory, and result from the combination of steps described in the Jungersen patent."

In the New York case, Judge Rifkind said (30, f. 90):

"Today cuttlefish casting and sand casting are of little commercial significance. Die stamping and the 'lost wax' process are pre-eminent in the production of rings.

"The evidence clearly supports a finding that, after Jungersen, the lost wax process as refined by him has been extensively employed in the manufacture of rings; and I shall therefore attribute to the patent 'commercial success.'"

and he found (Finding 5; 45, f. 135):

"5. Since the introduction into the jewelry trade of the Jungersen process, cuttlefish casting and sand casting are of little commercial significance. Die stamping and the process of the Jungersen patent are the only substantial methods now commercially used in the production of jewelry. His process, as described and claimed in the patent in suit, has been extensively employed in the manufacture of jewelry and is entitled to the attribute of commercial success."

Early Applications in the Fine Arts of the "Lost Wax" Process

The origin in the fine arts of the casting of bronze by the "lost wax" process is obscured in the mists of antiquity.

It is said to have been described by the monk Theophilus (*Encyclopedia Britannica*, 14th Ed., Vol. 4, 240*). The records here include a number of extracts from the sixteenth century treatises of Benvenuto Cellini on "Goldsmithing and Sculpture" (II, 448a-469a). Several applications of the process are described. The description is vivid and fascinating, but not too easy to follow. Concentrating, however, on the several ways in which Cellini produced his wax models or patterns, we can identify the following procedures:

(1) Describing a unique silver vase he made for Francis I, he explains the painstaking handwork by which the body of the vase was produced and says (450a): "After this you may proceed to fashion in wax whatever graces may have place at lip or handle, improving on the model or design with which you started". These wax "graces" modeled by hand were reproduced in metal by investing them in a mixture of pulverized earth, fine cloth shearings and "a little cows' dung, sifted through a sieve, then I beat it all well together". After painting the wax ornaments with a pigment made from tripoli and adding inlet holes and vent channels, he proceeded with the investment, heated the investment to melt the wax and let it run out through the vent holes and finally cast the molten silver into the cavity. In this case the first part of the investment was formed about the "graces" while they were still upon the vase, thus making a hollow mold portion like an intaglio; after melting out the wax the investment was removed from the vase and the opening where the wax had been attached to the vase was closed up with the investment material (450a-451a). When "you have masks and suchlike conceits to apply to your vase" (452a), a somewhat different procedure was followed. After fashioning them carefully in wax, they were taken off the vase and molds made of them by investment and baking to

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* See Appendix.

remove the wax. Then a coating of wax "a thin knife's back more or less in thickness, or of such thickness as you wish your mask to be", was laid into the hollow of the mold equally all over, the channels and vent-holes added and the whole filled with clay, bound around with wire, and cast in the same way as before. The cavity was, of course, the space left between the hollow mold portion and the clay core by melting out the thin layer of wax. In another place (455a), Cellini describes how he made "the Perseus for the most illustrious Duke Cosimo". This large figure was first modeled in a clay composition and finished "one finger's thickness under actual size", baked and modelled over with a coat of wax. He then coats his waxed figure with certain unguents, and with two or three coats of clay to form his investment, and then he says "I cast it" (455a, ff. 1363-4). Presumably before casting, the investment was baked and during this baking the wax coating melted out.

With this procedure, the original clay model was lost inside the final casting, and Cellini describes a second method in which the original model is preserved. In this method, he prepares his original model directly in a clay and rag composition and then covers the model with tin foil to protect the clay figure against the humidity and cohesive power of the gesso* of which the primary mold is to be made (454a). Then he makes a gesso mold of "as many small pieces as when put together would make a complete man, and that without any undercutting—as for instance feet, hands, head" (456a, f. 1366). Over these built-up small pieces, he forms a "mother mold" in two or more pieces depending on the size of the figure (457a-458a). Then after all of the little pieces have been fitted into the mother mold, he coats the inside of the mold with "about a good knife's back thick of wax or clay or paste", which he said is technically termed the *lasagna*. Part of the remaining description is not too clear but, as we under-

* "Plaster of Paris or gypsum as prepared for painting or in making bas-reliefs"; Webster.

stand it, he then builds over an iron frame a clay core which fits accurately within the mold, being spaced therefrom by the thickness of the lasagna. The lasagna is then removed, and he says:

> "Then you make the inlet holes in which you want to pour your wax and fit the kernel into the mold; then stand the figure up straight make at least four vent holes, two at the feet and two at the hands, the more you make the surer you will be to fill your figure with wax" (459a, f. 1376).

The heated wax is then poured into the cavity between the gesso mold and the core (460a). After the wax has stood for a day or two to harden or shrink a little, the mold is opened and the wax pattern nicely polished to remove all the rough edges left by the joinings of all the different pieces and to touch up the whole. "In doing this, morever, if you are minded to add any subtle labor or fancy to your work you are easily able to do it" (460a). After this, the wax pattern was invested, the wax removed by heating the whole to melt it out, and the molten bronze cast into the cavity left by the removal of the wax. By this method Cellini was able to preserve his original model, which he says enables you to work to great advantage because

> "many youths & able workmen can help you clean the bronze figure up, while if you have no model to work to, this cleaning up takes a long time, is little to the poor master's liking, and has but a sorry result" (454a, f. 1362).

The record also includes a translation of "La Gravure", etc., published in Paris in 1924. After describing plaster molding, the author says (470a, f. 1409):

> "The moulding of pieces which are not stripped, or of a full relief piece, is more difficult; it is even, in certain cases, impracticable in plaster, and we use flexible materials such as gelatin."

The gelatin molds are said to be "perfectly lasting" and "plaster, wax or gelatin may be poured into it hot without fear of destroying it, * * * ". In making the molds, the usual practice of forming two separable shells is followed and vent holes are provided by placing along the meeting edges "several grains of lead which, withdrawn from the mold, will form the corresponding number of cavities serving as vent holes when the wax or gelatin of the reproductions are cast". This gelatin mold is described at 471a-475a and the author says:

> "the principal advantage is the obtaining of waxes in every way similar to the model and which, cast in cire perdue* give perfect reproductions almost without retouching.
>
> *"cire perdue, literally 'lost wax' is known by this name. See Encyclopoedia Britannica, 14 Ed., Vol. 20, p. 229"

The article describes (475a) how in the "lost wax" process the wax model is removed by heat and says that for "small pieces of jewelry * * *. It is then preferable to cast the piece in gelatin, to take several proofs of it in wax" and to go on with the investment and removal of the wax by heating. Metal is then poured into the investment and a cover "full of moist clay or containing moistened asbestos", is pressed strongly down over the top of the investment and "the heat from the metal causes violent emission of steam which presses the fluid material into all the interstices of the mould" (II, 475a, f. 1425).

The *Encyclopedia Britannica* article on the cire perdue process (14 Ed., Vol. 20, p. 229) referred to in this "La Gravure" publication is reprinted as an appendix to this brief. It describes briefly but clearly the formation of a negative mold which is then lined with a coating of melted wax applied with a brush until it has acquired sufficient thickness to produce a replica of the sculpture in wax

sufficiently hard to permit handling. It says that the "artist can work on it as much as he pleases, obtaining rare results of details which makes this process of casting invaluable. Gates and vents in the shape of wax rods are then properly attached to the wax figure". The wax figure with the attached gates and vents is then invested, the wax melted out and the molten bronze poured into the prepared cavity.*

Another description of the use of the "lost wax" process in art casting is found in the 1930 publication "Diecasting Practice" by Marc Stern (482a). It does not differ in any significant way from what has already been discussed. The original hollow mold is made of plaster or glue. It is then closed and filled with molten wax which after a few seconds is poured out again, leaving a wax shell over the surface of the mold of a thickness in proportion to the size of the work. The hollow wax pattern thus produced is removed from the mold "so that the sculptor may supply any finishing touches or alterations deemed advisable. The gates and vents are then added at suitable points in the form of wax rods of different diameters". The wax pattern is then invested in a mixture of plaster of Paris, clay and asbestos fiber, the wax melted out, and finally the molten bronze is poured into the mold cavity.

The Use of the "Lost Wax" Process in Dentistry

The record does not contain any specific description of the making of the original wax pattern in dentistry, but there is, of course, no building up of a mold into which wax is introduced in a molten state, since the wax pattern is

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* Judge Clark, in the Court of Appeals opinion in Case 48, refers also to another article in the *Encyclopedia Britannica*, (Vol. 4, 14th Ed., 240) which we likewise reproduce. This is a brief and somewhat generalized description of that procedure which Cellini seems to have used in making his Perseus and which we have already discussed.

made by pressing warm wax into the troublesome cavity in the patient's mouth. "The wax pattern with gate and vents attached is covered with the investment compound in a small bucket" (485a, f. 1453). The wax is "lost" by heating, and the molten gold or alloy is cast into the resulting mold cavity by centrifugal casting (485a).

Haseltine's British Patent No. 2467, of 1875 (428a)

This British patent of 1875 adds vulcanized rubber to the list of mold-forming materials suitable for making the primary mold in the "lost wax" procedure.

> "The main object of this Invention is to produce a casting in metal from a given pattern, which casting will be a perfect copy of such pattern without requiring much, if any, after finishing or chiselling work" (428a/34, etc.).
>
> • • •
>
> "To produce such patterns of wax or similar material they are cast within pattern moulds or matrices of gum elastic, which pattern moulds are first formed on an original model and removed therefrom by slitting and stretching. The wax patterns are removed from the matrices in the same way and are then used for forming the permanent clay moulds" (429a/8-13).
>
> • • •
>
> "The said Invention is not restricted to any shape or form of pattern. It avoids the slow and laborious process of making false cores if the object to be cast be of such a shape as to necessitate the forming of the mould in several pieces, as in the case of a figure or statuette" (429a/18-21).

The molds are formed by building up about the mold a coating of rubber "about a quarter of an inch" thick by application of several layers of rubber in the form of

thin sheets "about 1/32 of an inch thick". The thickness of the coating may be varied according to the size of the article. "What is to be obtained is a thickness of rubber which will retain its shape after vulcanizing and bear its own weight without collapsing the elastic mould". (431a). The mold is then vulcanized under pressure, and after vulcanization "the rubber is cut in such a way as to permit the removal of the model" (431a-432a). The cuts are then rejoined by applying to them a thin rubber solution (432a/24-28) and an opening is cut for the introduction of wax (432a/20-21). This introduction of the wax is effected as follows:

> "Then the rubber mould is suspended in cold water for the purpose of cooling the wax and retaining the rubber mould in shape. Then the melted wax is poured slowly into the rubber mould at the opening cut for that purpose until full. If the object is of such a nature as to be hollow when cast in metal the surplus wax is poured out as soon as the wax has formed a shell by cooling on the sides first. When the wax has fully cooled in the rubber mould, which cooling takes place in a few minutes, according to the temperature, the mould is removed from the water, and at the place where the joint is in the rubber mould the said mould is easily torn apart, and may be readily removed from the wax pattern without injuring the finest parts thereof" (432a/28-38).

The subsequent investing of the wax pattern, "losing" of the wax, and casting of the molten metal into the cavity in the investment, are similar to what has been described already with this difference, that Haseltine introduces the molten metal into the investment under the pressure of a column of the molten metal in a standpipe (II, 430a/9-17). He constructs the furnace so "as to give a pressure of about 20 pounds to the square inch" (II, 430a/9-10).

Haseltine explains the need for the use of pressure in casting the molten metal as follows:

> "In order to produce a mould sufficiently porous to permit the escape of the gases generated, together with the air in the mould, and to permit the metal to lie closely to the surface of the mould after pouring, it has been customary in casting refractory metals to employ for the material of the moulds a coarse loam or sand and to pack it somewhat loosely within the flask.
>
> One object of the present Invention is to permit the use of a more compact and fine loam for the moulds, and of a very fine facing material to produce the surface or portion of the metal which comes in direct contact with the pattern" (II, 429a/22-31) and
>
> "It will be manifest to those skilled in the art that the use of a dense material for moulds necessitates the adoption of some mode of introducing a metal other than the simple mode of pouring it from a pot or ladle" (II, 430a/5-8).

Spencer's Patent No. 748,996, of 1904 (II, 400a)

Spencer is concerned primarily with improvement of the built-up rubber mold which he says may be "used to make duplicates in wax or other suitable material of the original pattern" (405a/76-79) as in the "lost wax" process. As in Haseltine's British patent of 1875 the only procedure suggested for getting the wax into the primary mold is by pouring it in.

In preparing his rubber mold for filling, Spencer says that (410a/41-46):

> ". . . it should have any number of small vent-holes pierced through it that may be found necessary to allow for the escape of air in any space where it would be inclined to collect when the mold is being filled with the composition used in making the reproduction."

As to getting the wax into the rubber mold, Spencer says (410a/69:76):

> "the reproduction is made by pouring into the mold the material G, Fig: 7, desired either in a liquid, semi-liquid or fused state, or the material may, if in a plastic condition, be worked in by hand if the form of the mold will permit it, or if the mold will not permit of the hand being used in filling it then it may be filled by any other suitable means."

Kralund's Patent 1,238,789 of 1917 (414a)

Kralund discloses a very special application of the "lost wax" process to the production of commercial castings of large bulk by the "pressure die-casting process". The pressure die-casting process is a modern technique for quantity production of identical replicas of a given model or pattern, based upon the use of metal molds into which the pattern is cut (sunk) by machine tooling. These costly machined metal dies are used over and over again, distinguishing die-casting from casting methods in which the mold is destroyed after each casting operation. ("Die-casting Practice", Marc Stern; 478a, f. 1433 and 489a, f. 1466.) Kralund explains that when pressure die castings are made of high fusing metals, there is rapid destruction of the metal mold or die from the high temperatures so that economically speaking "the pressure die process is limited to the production of comparatively small castings * * * I refer to those castings, the weight of which is from two to three pounds or less" (414a; 1/40-52). By his method he proposes "to produce castings of larger bulk than is possible with the pressure die-casting process" while avoiding "the wastage due to the destruction of the die from the high temperatures of the metal used in making the casting * * *" (ll. 54-64). He says he secures the desired result "by the use in rotation of certain steps and practices, some of which are old and well known in the art of

making dental inlays, the method or art of my invention differing from those heretofore practiced in that the basis of the method or art of my invention is the production of a large number of patterns by the pressure die casting process and in a steel mold * * *" (ll. 70-78) while at the same time avoiding the deleterious effect of high temperatures which occurs when the pressure die casting process is applied to large castings. He points out that the difficult conditions accompanying the making of larger castings by the pressure die-casting process do not occur in the making of dental inlays and similar articles. He says (415a; 2-17):

> "In the production of dental inlays and in the production of similar articles whereby only one article is required, the conditions above referred to do not enter into the method. It is merely necessary to approximate the dimensions required in the casting and there are no cores or obstructions to be taken into consideration. In fact none of the conditions found in the dental art are present in the art of making commercial castings for machine parts used in different mechanisms. The nature of the product is different and the metals used in the commercial casting art have entirely different characteristics from those used in the dental art."

He avoids the wastage due to the destruction of the steel dies by the higher temperature of the metal in large bulk by applying the "lost wax" procedure in pressure die casting with steel molds. In this way, the original steel die is subjected only to the temperature of the wax and not to the high temperature of the cast metal. The wax is forced into the steel mold under the high pressure characteristic of the pressure die-casting process, the die having been "provided with the usual vents" (415a/72). The purpose of the pressure is to give the wax pattern "a sufficiently hard surface to permit its handling in making the plastic mold

and in finishing the pattern prior to the making of the said plaster mold. This finishing consists mainly in removing any fins at the line of demarcation between the mold sections or at the vent openings therein" (415a/77-83). See also other references to the finishing of the wax pattern (414a/99-104 and 416a/4-9).

When the final plaster mold has been completed by baking the investment, he no longer uses the high pressure of the pressure die-casting process to cast the metal into that plaster mold; but introduces the molten metal into the baked investment mold "by means of a pressure die-casting apparatus in which metal is cast under very low pressures, the ordinary die-casting method of die pressures being impracticable with a mold as fragile as the one above referred to." (415a/114-119). He says that with this method it is "commercially practicable" to produce castings "providing such castings are of sufficiently great bulk. The method, however, is not particularly adaptable to the production of small castings by reason of the relatively greater expense as compared with a pressure die casting." (415a/128-416a/3). He ends his specifications by saying that it is not his "intention to claim broadly the making of a plaster mold about a fusible pattern and the evacuation of said mold by subjecting it, and the pattern therein contained, to a temperature which will fuse the pattern. What I desire to claim is a method utilizing these old practices, and in conjunction therewith the dominant and essential step of preparing the pattern in a metal mold, which step is essential in the production of commercial castings * * *" (416a; 39-52).

McManus Patent No. 1,457,040, of 1923 (417a)

This patent discloses an improvement in centrifugal casting machines. Since centrifugal casting of molten metal into investment molds is conceded to have been common practice in dentistry long before McManus' patent, the

only part of his disclosure we need direct attention to is the following statement (418a/17-32):

> "While the machine illustrated in this application and those illustrated in my former patents have been designed more with a view to their utilization in connection with the making of dental castings, such as for inlays, crowns, bridges, porcelain work, etc., the same principle, with slight modifications in the structure of the apparatus, may be equally as well applied to the casting of jewelry, such as gold rings, small trinkets, etc., where metal or other dies or moulds may be used to be filled by centrifugal casting methods, and, of course, if larger scale operations are desired, suitable modifications in design will readily adapt the apparatus to such purposes."

McManus discloses nothing about how to make initial molds for intricate patterns or how to get wax into such a mold.

Specifications of Errors

In case No. 7, the errors urged are that the Circuit Court of Appeals for the Third Circuit erred (Petition, No. 467, 1947 October Term, pp. 14-15):

1. In failing to hold claims 5 and 6 of the Jungersen patent in suit valid.

2. In failing properly to interpret claims 5 and 6 on the basis of the disclosure in the specification.

In case No. 48, the errors urged are that the Circuit Court of Appeals for the Second Circuit erred (Petition 776, 1947 October Term, pp. 3-4):

1. In failing to hold claims 1-6 inclusive valid.

2. In holding claims 1-5 inclusive invalid for want of invention.

3. In holding claim 6 invalid for lack of novelty.

4. In affirming the judgment of the district court.

ARGUMENT

I. Despite a long-felt want which had existed unsatisfied for many many years, Jungersen's method in its entirety had never been assembled before. Its production by him was a substantial—even revolutionary—technical innovation, for which society is truly indebted to him. The test of history, as it appears from the record, conclusively proves that Jungersen's forward step was not obvious; that it did require more ingenuity than the work of a mechanic skilled in the art.

II. The broader claims 5 and 6 can be and should be so construed as to embrace but not to extend beyond what Jungersen truly invented; the new method specifically described when practiced with the substitution of known equivalents for some of the steps particularly defined in narrower terms in claims 1 to 4. When so construed, claims 5 and 6 are infringed by the low pressure injection of the melted wax into built-up soft metal molds by the force of a syringe or the like, sometimes substituted for centrifugal force by the alleged infringers.

I.

The making of small articles of jewelry of intricate detail with hollows, undercut portions and perforations runs back to the earliest times of recorded history. In the fine arts, the casting of bronze by the "lost wax" casting process also emerges from prehistoric times. The fascinating sixteenth century manuscripts of Benvenuto Cellini disclose a number of ingenious and skillful applications of the "lost wax" process by that master craftsman; but not its extension to the field opened up by Jungersen—the repetitive production of small metal articles of jewelry of intricate detail, designed with hollows, undercut portions and perforations.

The basic tools employed by Jungersen in 1933 were available to Cellini and his confreres 400 years ago. The

making of the wax model, its investiture, the evacuation of the investiture, and the casting of the metal into the dispensable mold, were studio tools in the process of casting bronze and precious metals. The building up about the model of a primary mold of glue or gelatin was also known and, with the advent of vulcanized rubber, that material was employed for the purpose, as disclosed in the Haseltine British patent more than half a century before Jungersen, and again more than a quarter of a century before Jungersen in Spencer's United States patent. The casting of precious metals into investment molds by centrifugal force has been practiced in the dental art at least since the beginning of this century and, in McManus patent 1,457,040 of 1923, the use of centrifugal force to cast molten metal into "metal or other dies or molds" to produce "castings of jewelry, such as gold rings, small trinkets, etc.", is proposed. Yet such small articles of jewelry continued, as the record shows, to be manufactured only by handcraft or by die-stamping or by the two primitive and inadequate casting methods, cuttle fish casting and sand casting, which were incapable of producing more than a "dummy" that had to be finished by skilled artisans. The difficulties lay in the inability to establish and to maintain through the successive steps of the casting process the intricate detail, with hollows, undercuts and perforations. Jungersen overcame those difficulties and revolutionized the procedure in the commercial manufacture of such articles by his six-step process, and particularly by building up about the first model a primary mold of plastic mold-forming material such as rubber and then projecting the wax into the fine interstices of the rubber mold by centrifugal force.

The result was a procedure which rendered obsolete the old casting processes used in the manufacture of jewelry, and even encroached upon the old die-stamping process; extending the art into the production of intricacies of design which cannot be fashioned by die-stamping, and reducing the cost wherever, even in simpler designs, the

quantity of finished articles to be produced is insufficient to offset the relatively high cost of the stamping dies. The art now has a commercial practicable method of casting articles which formerly could not be repetitively produced at all or could be produced in quantity only with the help of skilled artisans at substantially greater expense.

Here is the nub of the case: There is no debatable rule of law involved. It is conceded that mere absence of anticipation—mere novelty alone—is not enough; that the subject matter must display invention; more ingenuity than the work of a mechanic skilled in the art. The application of that long-established rule in particular cases rests in each case upon a finding of ultimate fact. The concurrent findings of the lower courts agree as a matter of fact, that there was the long-felt want unsatisfied for many, many years; that with all the prior knowledge of the men skilled in the art, they had not gone beyond the use of the inadequate methods of cuttle fish casting and sand casting in the production of these intricate articles of jewelry until Jungersen came forward, and that when Jungersen did bring his method into public knowledge, it quickly superseded the old casting processes and, as is usually the case with such technological innovations, far surpassed their possibilities in intricacy of detail and so encroached economically upon the manufacture of such articles by die stamping while extending the manufacturing possibilities into more refined and extensive fields. On this evidence, the factual conclusion must be, we submit, that Jungersen's forward step was not obvious and that it did require more ingenuity than the work of a mechanic skilled in the art.

The validity of the patent should therefore be sustained unless there is now unearthed in this or in some other related art an anticipation of Jungersen's methods; something on which the Court can say that Jungersen's method was not new; something of which a jeweler grappling with the problem solved by Jungersen, and having no knowl-

edge of Jungersen's method, would say, if his attention were directed to it, "That gives me what I wish".*

It is clear that there was no such anticipation of Jungersen's method.

It seems to us that the nearest approximation to it is the procedure disclosed in British patent of 1875 to Haseltine or equivalently in the United States patent of 1904 to Spencer. This was recognized by Jungersen in his British patent where he said (495a/1-19-28):

> "In the casting of metal it is not broadly new to make an elastic mould from an original sample or model, to produce a wax or fusible pattern with the aid of the elastic mould and to remove the pattern from the latter and invest it in a final mould from which the wax or fusible pattern is subsequently melted out to permit of the pouring of metal into the mould cavity thus vacated."

And the claims of Jungersen's British patent were distinguished from that prior knowledge by defining a method (496a/112-121) "characterized by the centrifugal casting of a model of wax or other readily-fusible material within a flexible mould which has been prepared from an original model or sample, effectively to displace the air in the mould cavity and force the model-forming material intimately into all the design and/or pattern forming recesses of the cavity surface".

Upon rejection of this application by the British Patent Office, an appeal was taken to the Patents Appeal Tribunal of the Royal Courts of Justice. Judgment on that appeal, in favor of Jungersen, was given by Mr. Justice Luxmoore (508a-513a). In his judgment, Justice Luxmoore said, "The point I think is really in a small compass." (509a, f.

* *Skelly Oil Co.* v. *Universal Oil Products Co.*, 31 F. 2d, 427, 431.

1526); and, after reviewing the testimony of expert witnesses (510a-512a), he concluded:

> "Mr. Cousin in his decision says at page 7: 'It is agreed that on the evidence there is no disclosure of the casting of the wax or like model in a flexible mould in a centrifugal casting machine.' Then he goes on to say: 'This step forms the invention of the applicant's claim 1, and the question before me is whether such use of a centrifugal casting machine in carrying out one step of an admittedly known sequence constitutes an inventive step to justify the grant of letters patent.'
>
> "The real question is whether that is an obvious step or not. The evidence shows clearly that there was a long-felt want for a method of casting articles of the particular nature which can be produced by this invention; that in spite of the long-felt want, the solution to the difficulty was not found until Mr. Jungersen's invention was made. In those circumstances I think it would be impossible for me to hold that the step is obvious." (512a; ff. 1535-6).

Here is a concise statement of the basic issue now presented to this Court, and we submit that Mr. Justice Luxmoore's disposition of it was the correct one.

In this Court there is ample authority, extending over all the years of our own patent system, for finding patentable invention as an ultimate fact where the evidence establishes, as an historical fact of industrial technology, such a series of events as those proven in this Jungersen case.*

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* *Universal Oil Products Co.* v. *Globe etc. Co.*, 322 U. S. 471, 486; *Goodyear etc. Co.* v. *Ray-O-Vac Co.*, 321 U. S. 275, 279; *Paramount Publix Corp.* v. *Amer. Tri-Ergon Corp.*, 294 U. S. 464, 474; *Bibel Process Co.* v. *Minnesota etc. Co.*, 261 U. S. 45, 68; *Hildreth* v. *Mastoras*, 257 U. S. 27, 34-5; *Expanded Metal Co.* v. *Bradford*, 214 U. S. 366, 381; *Carnegie Steel Co.* v. *Cambria etc. Co.*, 185 U. S. 403, 429-30, 446; *Potts* v. *Creager*, 155 U. S. 597, 608; *Keystone Mfg. Co.* v. *Adams*, 151 U. S. 139, 144-5; *Krementz* v. *Cottle*, 148 U. S. 556, 560; *Consolidated Valve Co.* v. *Crosby Valve Co.*, 113 U. S. 157, 179; *Loom Co.* v. *Higgins*, 105 U. S. 580, 591; *Smith* v. *Goodyear etc. Co.*, 93 U. S. 486, 495-6.

We submit also that, as a matter of wise public policy, where the established facts, as in the instant case, disclose without doubt or equivocation the long existence of the unsatisfied want, the persistent adherence of those skilled in the art to other and inferior practices, and the final abrupt shifting of the practical technology to new ranges of usefulness upon the introduction of the patented procedure; then there is no conclusion more consonant with the basic purpose of the patent law than the conclusion that patentable invention exists.

In such cases there is, of course, always the temptation to wonder why the minds of earlier workers in the art did not arrive by a mere process of reasoning at the patented solution. It is a trite and familiar remark that problems once solved present no difficulties. Indeed, to protect our advancing technology against unjustified and therefore burdensome monopolies, it is always necessary to ask whether the patented procedure was more than the natural step-by-step progress of improved technique among the body of skilled workers in the art; whether it was, on the one hand, such a step-by-step advance or, on the other hand, a leap ahead achieved by the intuitive and creative faculties of the mind.

But the record in this case leaves no doubt about the answer to that question. Here the technology of 1933 shows no advance certainly since Haseltine in 1875; and really no fundamental change since Cellini. The basic purpose of our laws being not so much to reward the individual as to bring to the public those benefits which arise from progress in science and useful arts, it is wholly in accord with the best practice of that patent system to give controlling weight to historical evidence which shows the long period of standing still followed by an abrupt and marked advance, rather than to speculations about the mental hazards or the apparent astigmatism of the men skilled in the art; which may now seem difficult to ex-

plain, but which in fact kept them from taking the step ahead.

While the benefit to the public lies in the advancement of the arts and sciences rather than in the reward to the individual, yet it is the offer of the limited patent monopoly which is the inducement to the individual to disclose his innovation and to bring it promptly within reach of the public. The instant case shows clearly the beneficent effect of that inducement. Jungersen's process is of a nature that would lend itself very well to secret practice. It would have been well within the possibilities for him to carry on his process in secret to his sole commercial advantage, since the finished product does not disclose the nature of the process by which it was produced (Cf. Judge Meaney's discussion of the asserted, now withdrawn, prior use by Slatis, 27a-28a, ff. 80-84). Jungersen did not follow that plan. He immediately disclosed his process to others, applied for patents on it all over the world, participated actively in making the new method available to the public, and sought his reward under our patent system by the collection of reasonable license fees from any and all manufacturers who wanted to use his method. He responded to the incentive of the patent system and payed its price of disclosure to the manifest advancement of the useful arts and prompt benefit to the public.

Judge Meaney in his decision now under review in Cases Nos. 7 and 8 (22a-32a), held that "Insofar as claims 1 and 4 are concerned, in the view of the court, the Jungersen patent discloses that 'flash of creative genius' sufficient to provide the basis of patentability, and it is no argument for invalidity to assert that the use of centrifugal force is the mere substitution of equivalents which do substantially the same thing" (26a-27a). As we have already noted, Judge Meaney's conclusions were affirmed by the Third Circuit Court of Appeals in a *per curiam* opinion.

In Case No. 48, Judge Learned Hand in his dissenting opinion (216-219), after reviewing the prior knowledge in the art, said (217, f. 650):

> "Nevertheless, in spite of all these approaches, and of the fact that all the elements of the disclosure were to be found in the prior art, it remains true that Jungersen's process in its entirety had never been assembled before; no one had ever thought of combining all those steps in a single sequence."

and (218, ff. 652-654):

> "In the case at bar the answer must therefore depend on how we shall appraise the departure from what had gone before in terms of creative imagination; indeed, I do not understand what other test could be relevant."
>
> "If that be the test, I submit that Jungersen's process meets it. From time immemorial jewelry had been manufactured by the earlier processes; so that the need, if need there was, had existed for years. Moreover, two of those earlier processes—'cuttlefish casting' and 'sand casting'—have now become 'of little commercial significance'; 'die-stamping' and Jungersen's process 'are the only substantial methods now commercially used'; and in the manufacture of a hundred rings or less 'die-stamping' is more expensive. Had some technological advance held up the change, and had Jungersen made it only a short time after the obstacle had been removed, I should agree that the inference of outstanding originality would have been greatly weakened; but that was not the fact. Indeed, it is the very basis of the defence that for years all the elements lay open and available, and that nothing was needed, but the paltry modification which has proved so fruitful. To that I make the answer on which courts in the past used to ring the changes with wearisome iteration. If all the information was at

hand, why was the new combination so long delayed? What better test of invention can one ask than the detection of that which others had all along had a strong inventive* to discover, but had failed to see, though all the while it lay beneath their eyes?"

It is idle to speculate about what inhibited men skilled in the art from copying the most intricate details in a primary mold built up of rubber and then making a perfect wax replica of the original model by filling all of the intricacies of the rubber mold with melted wax projected into the mold by centrifugal force. The facts appear to be that the art used under various circumstances a number of different kinds of force to introduce molten metal into casting molds. In casting metal, the problem of air pockets is taken care of by vents as in Kralund or by the use of porous investments in which the air is forced into the pores of the mold by pressure as in the dental casting process (93, f. 277). There was, always, the weight of the molten metal itself, and this had been supplemented by the somewhat increased pressure due to the weight of a column of the molten metal in a standpipe, as in Haseltine's British patent; there was the use of steam pressure as described in the La Gravure article; there was the use of centrifugal casting machines to cast molten metal into molds, including the investment type of porous mold resulting from the evacuation of the investment from the wax model in the dental casting art, and in the disclosure of McManus' patent of 1923. And there was the practice of pressure die casting in which the molten metal was forced into and compacted in vented steel dies into which the contours of the original pattern had been sunk by machine tooling.

Up to the time when Jungersen appeared, the only proposal to apply any of these various forces to the in-

* Undoubtedly this should be "incentive".

troduction of wax was Kralund's plan which proposed to use the high pressure of pressure die-casting to force wax into the metal dies to protect those expensive dies from the excessive temperature of the molten metal when large pieces were to be cast. Looking back from our present knowledge, we are inclined to think that the application of any or all of those different kinds of force to the introduction of wax into an intricate mold would be obvious. Yet, closer observation shows that these different ways of forcibly introducing molten metal into molds would not all of them by any means be usefully applicable to the introduction of wax into an intricate flexible rubber mold. There is no evidence in the procedures followed by the alleged infringers or elsewhere in this record that wax could be effectively introduced into the intricacies of such a mold by the pressure of the weight of a column of wax in a standpipe as in Has[illegible]ine's metal casting step, or by using the heat of the fluid metal to create steam pressure in the mold as in the La Gravure article; and it is clear that the problem that confronted men engaged in the casting of small articles of jewelry could not be solved or even simplified by Kralund's plan to produce large castings by using the high pressure of die casting to force the wax into vented steel molds. There would be no economy—indeed, no sense—in applying that practice to their problem. In the first place, the cost of the original steel dies for pressure die casting is at least as great as the cost of stamping dies; secondly, when once the expense of making metal dies for casting a piece of jewelry by pressure die casting had been incurred there would be no sense in resorting to the "lost wax" procedure at all, since there is no difficulty in casting small articles directly by pressure die casting in the steel dies (Kralund patent 414a/1/45-52 and 415a/2/129 to 416a/1/3); and, thirdly, the plastic molds used by Jungersen to reproduce all of the fine intricacies of his pattern cannot withstand the high

pressure of pressure die casting as Kralund proposed to use it*— a pressure which he says is too great to be withstood even by the plaster of Paris investment molds. (See also 97a, f. 291; 98a, f. 294; 145a, f. 434.)** We can now see, therefore, in our backward look after the solution has been disclosed, that Jungersen hit upon the only one of the several kinds of force previously used for metal casting that would be of any use in the introduction of wax into the intricacies of the flexible rubber molds.

This review of our hindsight, however, is only another way of saying that it is a waste of time to speculate about what might have been when the evidence upon close examination with all proper safeguards, shows that the solution was not apparent to men skilled in the art throughout a long, long period of existing want. The probative force of this evidence is not to be overthrown by any rationalizations after the event that anyone could have done what Jungersen did.

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* In Jungersen's patent "the effect was the application of force, a small amount of force, to cause it to flow a little better into the details" (Tour, 159a, f. 477), and "If * * * the casting to be made in the mould is going to take considerable pressure or must be very accurate in dimensions, then the flexible moulds are too yielding to permit of the high pressure, or give the accuracy required" (Tour, 151a, f. 451).

** In addition, Kralund's process produces a pattern which must be finished before it is invested and used as a fusible pattern. Fins are formed at the joints of the mold sections and at the vent openings (ante, p. 23).

II.

The broader claims 5 and 6 can be and should be so construed as to embrace but not to extend beyond what Jungersen truly invented; the new method specifically described when practiced with the substitution of known equivalents for some of the steps particularly defined in narrower terms in claims 1 to 4. When so construed, claims 5 and 6 are infringed by the low pressure injection of the melted wax into built up soft-metal molds by the force of a syringe or the like, sometimes substituted for centrifugal force by the alleged infringers.

When claim 5* is compared with claim 1, for example, it is seen that they differ in two significant particulars: (1) Where claim 1 defines the method of making a primary mold as "then forming about said model a primary mold of a plastic material which will retain a lasting shape through subsequent treatment", claim 5 says more broadly "then forming about said model a primary mold"; and (2) where claim 1 defines the method of introducing the wax into the primary mold as 'then by centrifugal action forcing into the primary mold molten wax or other material of a low fusing point that will not injure the primary mould", claim 5 says "then introducing into the mold by force sufficient to deposit the material into the depression or depressions of the primary mould molten wax or other material of low fusing point that will not injure the primary mould."

Judge Meaney held that claims 5 and 6 "in the light of the prior art and more particularly in view of Kralund patent 1,238,789, are anticipated and invalid" (29a, f.

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* Judge Rifkind found article claim 6 "also invalid because it describes an old article in terms of a process of manufacture" (39, f. 117). The Second Circuit Court of Appeals, having found lack of invention in Jungersen's method said "What we have said, of course, disposes of claim 6, the product claim. There is nothing new in the product" (216, f. 647).

86). That conclusion rests upon an interpretation of those claims that extends their scope beyond Jungersen's true invention. That must be so since Judge Meaney found that the method disclosed in Jungersen's specification and defined in claims 1-4 was something patentably new beyond the reach of the man skilled in the art.

Judge Meaney (29a, f. 86-31a, f. 91) thought that the patentee's contention of novelty and validity of claims 5 and 6 presented the following dilemma: Either those claims (1) "clearly and specifically claim the use of applied force in depositing molten wax into the primary mold" or else (2) "by implication they ask the Court to read the use of centrifugal force into the specifications of claims 5 and 6" (29a, f. 87). He held that "The use of 'centrifugal force' to deposit the material" could not "be read into and made a part of the specification of claims 5 and 6" (30a, f. 88) and the other alternative, construing them so broadly as to cover the use of any and all kinds of applied force in depositing molten wax in the primary mold, led him to the finding of anticipation by the Kralund patent in the light of the prior art.

But the fact is that the correct interpretation of claims 5 and 6 lies between those two extremes. The true position is, we submit, that claims 5 and 6 could and should have been interpreted to embrace the whole of but nothing more than what Jungersen invented; that they are properly interpreted to cover, and are properly restricted to, the use of centrifugal force and *any similar force which is recognized to be the equivalent of centrifugal force* when applied in the environment defined by the other steps of Jungersen's process. That interpretation would have excluded Kralund's procedure which is not at all the equivalent of, and cannot be substituted for, Jungersen's and yet it would have avoided a construction of Jungersen's patent excluding all equivalents.

The very nature and purpose of the patent contract is such that a conclusion excluding all equivalents ought to be avoided, if it reasonably can be within the statutory requirement that the patentee must "particularly point out and distinctly claim the part, improvement or combination which he claims as his invention or discovery" (Sec. 48a, R.S., U.S.C., Title 35, Sec. 33).

Judge Rifkind's decision (No. 48) "that the claims are all invalid because anticipated and for want of invention" (39, f. 116) rests, as does Judge Meaney's decision of invalidity of claims 5 and 6, upon a reading—a misreading, we submit—of the whole patent—all its six claims—as an assertion of monopoly broadly covering the introduction of the wax by any one "of the several modes [known in metal casting] for the application of force, namely syringes, air pressure and centrifugal machines". His reasoning was "Clearly the use of force for casting the metal is old; Haseltine, La Gravure and Kralund taught it. The need of force for casting the wax was taught by Kralund who used a die casting machine. Moreover, by his claim of infringement plaintiff practically concedes the equivalence of the several modes for the application of force, namely, syringes, air pressure and centrifugal machines" (36, f. 107).

This approach was carried over—into the conclusion and the majority opinion of the Second Circuit Court of Appeals. Thus, Judge Clark, in that opinion, said (212, f. 635):

> "Thus plaintiff's patent can be sustained only if the use of force to cast the wax and the metal is such a change of a known method as to amount to invention."

With this approach—assuming that no one force was different from any other in its way of operation or result when used to get the wax into the plastic and impervious

primary mold—the court reached the conclusion that Jungersen's method was anticipated by Kralund; that it lacked novelty. If that were the case—if Jungersen's method had not been new in the objective sense that no one had ever thought of combining all his steps before in a single sequence so that his process in its entirety had never been assembled before—then the old process could not have been patented merely by turning it to a new use, as Judge Learned Hand pointed out in his dissenting opinion (217, f. 650). But the fact is that Jungersen's process in its entirety had not been assembled before for any purpose, and so the question arises whether its change from what was done before, however trifling that item of change may appear to be after the event, is such a change as to result in patentable invention under our Constitutional provisions and our Patent Laws. As we have said, that question really becomes, under such circumstances as are in the present case, a question of ultimate fact rather than a question of law.

The Construction that Should Be Given to Claims 5 and 6.

No patent claim can validly be construed to extend the patent monopoly beyond the inventor's real invention. An unambiguous claim for more than the patentee was entitled to claim as new is, of course, invalid; and a claim so indefinite that, even when illuminated by the patentee's disclosure, it cannot reasonably be construed to define a monopoly within the limits of the patentee's real invention is likewise invalid, for failure to "distinctly claim" the invention as the statute requires.

But when the thing disclosed in the patent is in truth a meritorious invention, then the claims will, if reasonably possible, be construed to embrace as much of his invention as the patentee intended to secure by his patent.*

* Robinson on Patents, Vol. 2, Par. 735-739, pp. 484-491.

In the application of these established rules of law, the question is: What is an equivalent in the combination for the particular step or element which the alleged infringer has changed, and is the thing he has substituted such an equivalent.*

Use By the Alleged Infringers of Other Injection Forces Than Centrifugal Force.

The specification of Jungersen's patent does not name any equivalent for the centrifugal force under which he proposed to project the wax into the rubber mold. The language of claim 5 which evidences his intention to claim equivalents is, "then introducing into the mould by force sufficient to deposit the material into the depression or depressions of the primary mold, molten wax or other material of low fusing point". The patent specifications does, however, disclose in detail the mode of operation of the centrifugal force when applied to the wax. The patentee says (185/2/9-25):

> "The wax or metal is thus forced into the mould and by the centrifugal action displaces the air within the mould, the molten material congealing first against the exposed surfaces of the cavity formed in the mould and any air which may be trapped in a recess of the mould will be crowded back into the fluid body under the pressure applied thereto and the fluid material will advance into the recess as it crowds the air therefrom and will progressively congeal against the wall of the recess until the extreme limit is reached so that the finest of cavities will be completely filled."

Thus, the mode of operation of the centrifugal force on the molten wax is seen to be that it injects or throws the

* As to those cases in which the alleged infringers now before the Court used centrifugal force, there is no denial of infringement.

wax particles into the mold under the momentum imparted to them by the rapid rotation of the centrifugal machine, forcing the wax into the impervious mold and displacing the air within it, any trapped air being crowded back into the fluid body under the centrifugal pressure applied thereto so that the fluid wax advances into the recess as it crowds the air therefrom, congealing first against the exposed surface of the cavity in the mold and progressively congealing against the wall of the cavity until the extreme limit is reached and the finest intricacies completely filled. At the trial (Nos. 7-8) this mode of operation was again described by Mr. Jungersen, in answer to questions directed to him by Judge Meaney, as follows (86a, ff. 257-258):

> "Then I put it into the centrifugal casting machine and lay this in here, with the gate hole up towards the crucible; then I just take a little spoonful of wax and pour it in like this here and let her swing.
>
> "The Court: Now, that throws the wax into the mould.
>
> "The Witness: That throws the wax into the mould, and the air will escape out through the same entrance where the wax entered in.
>
> "Q. It is necessary to have an escape of air so that the model will be an exact duplicate? A. The escape is through my gates.
>
> "Q. Yes, but I say it is necessary to have an escape of air— A. Yes.
>
> "The Court: Through the same aperture through which the wax entered?
>
> "The Witness: That is true.
>
> "The Court: As the wax goes in the air is forced out."

In Case 48 Mr. Jungersen, questioned by opposing counsel about the action of centrifugal force on the wax in his

method, as compared with the centrifugal casting of metal into the plaster investment molds in dentistry, testified as follows (92-93, ff. 277-278):

> "A. It is under an entirely different circumstance. If you are speaking about a mold that has been used by the dental trade, for filling that with centrifugal force, that is a different mold, and whether [there] the metal can enter and force the air out through the pores in the mold, but that is an entirely different thing when you cast the wax in there, because the wax comes in and that is not a porous mold. In this case that is a closed mold where the air can only escape out through the gate ordinarily, and if you pour the wax in then it will only come in halfway and it will stop."

It is apparent from what we have already said that the mode of operation achieved in Jungersen's method cannot be brought about by the mere application of pressure to supplement the weight of the molten metal or the molten wax, and significant confirmation of this is found in the fact that none of the alleged infringers uses the pressure methods of Haseltine's standpipe or of the La Gravure article or of Kralund's pressure die casting.

In Cases 7 and 8, the charge of infringement is based upon the procedure stated in plaintiff's particulars (20a, f. 59), as follows:

> "(b) The master pattern is removed and melted wax is squirted from an eye dropper or syringe into a channel in the mold and thus into the mold cavities; which cavities correspond in shape and design to the master pattern;"

In Case 48, Judge Rifkind describes the practices of the alleged infringers thus (29, f. 86; and see 123-124, ff. 367-370):

"To inject the wax into the primary mould all use a centrifuge and some also use an eye dropper or syringe, air gun, air injection machine, hydraulic machine and vacuum casting machine."

As to the operation of a syringe and the other substitutes employed by the alleged infringers, the testimony is that they are all injection processes. Thus, Mr. Jungersen testified (97, f. 291):

"Q. You can inject wax with a syringe, can you not, into a rubber or metal mold? A. Yes, if you have a closed—no, I was trying to say if you had a closed system you cannot inject it, but you can inject it into any void.

"Q. You can then inject wax with a syringe into either a multi-part metal mold or into a rubber mold, can you not, Mr. Jungersen? A. I believe so, yes.

"Q. And you can do the same thing with molten material with an air pressure machine, can't you? A. I believe so, if you don't trap the air.

"Q. And the vacuum machine also, Mr. Jungersen? A. Yes, if you don't trap the air or freeze it up on the way in.

"Q. But all of those instrumentalities are used for the purpose of injecting a molten material into a mold, are they not? A. I presume so, yes."

Respondents' [defendants'] witness Schneider, a caster for respondent Axel Bros., testified that they used three variants to do their wax casting, "the syringe, injector machine, and centrifugal machine" (131, f. 393). If he were going to make a few finished articles he "would use the syringe"; if he were going to make many, he "would use the centrifuge, or the injector machine", because of the greater speed of operation (132, f. 395), and he testified (133, f. 397):

"Q. Will you describe the operation of the air pressure injection machine? A. It is worked on the same principle as the ordinary eye dropper, or the syringe, but only we introduce compressed air into the machine, forcing our wax out into the metal or the rubber mold.

"Q. It consists of the wax pot? A. Yes.

"Q. And the mold is pressed against the nozzle? A. That is right, and the air comes out, and it forces the wax into our mold."

In the product, whether the wax replicas were made by the injector process or by the centrifugal machine, or by the syringe method, "there was not any difference whatsoever" (134, f. 401).

Use by the Alleged Infringers of Primary Molds Built Up of Soft Metal Instead of Rubber

In the specification the inventor says:

"This model is placed upon a base and a flexible mould-forming material such as rubber, is built up around the model. * * *" (185/1/33-35).

and

"The mould thus constructed is preferably made of rubber and when the rubber material completely surrounds the model it is suitably vulcanized and caused to flow intimately about the detail structure of the model and thus assumes a permanent shape having a cavity the exact shape and detail of the model embedded therein" (1/49-55).

* * * * * * * * *

In the claims the nature of the primary mold is variously defined as follows:

Claim 1:* "then forming about said model a primary mould of a plastic material which will retain a lasting shape through subsequent treatment."

Claim 2:** "then forming a primary mould in separable sections thereabound of plastic material capable of assuming intimate contact with the intricate designs of the model and adapted to retain the assumed shape."

Claim 5: "then forming about said model a primary mould".

The evidence in Cases 7 and 8 is that defendants use (Particulars, 20a, f. 59) * * *.

> "A metal mold comprising from three to five pieces, position[ed] within a two-piece aluminum mold frame of standard design, is built up around a master pattern * * *".

The metal used is "a soft alloy" (348a, Q.85).

In No. 48, some of the alleged infringers "use soft metal moulds as well as rubber moulds" (Opinion, 29, f. 86; and see 123-124).

From the evidence it appears that the soft metal mold is formed about the original model by casting a soft metal alloy which melts above the boiling point of water about successively exposed sections of the original model about which the soft metal flows and takes the shape in negative of the mold. This procedure is differentiated from that when the die is formed by machining into hard metal as

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* Claim 3 is subordinate to claim 1.

** Claim 4 is subordinate to claim 2.

*** At the trial evidence on the subject was limited to this statement in the Particulars (135a, f. 404).

in pressure die casting, in which case there is no need of a model (Tour 153, f. 458).*

The men skilled in the art had known for many years several equivalent ways of forming a primary mold of a flexible mold-forming material such as rubber about a model, in the practice of the "lost wax" process.

The testimony of respondents' [defendants'] expert Tour in No. 48 is (161, f. 482):

> "Now, you referred to the several different types of mold; the rubber mold of Hazeltine and Spencer, the gelatin mold of 'La Gravure' and the multipart ceramic mold of Cellini. You have also referred to the mold or die of Kralund. Will you explain whether or not molds of these various types are and have been generally and interchangeably used in the casting art? A. They have been used generally and still are used generally and interchangeably in the casting art. Wherever a specific thing or method seems most applicable that is the one that is used.
>
> "Q. And for how long has that been true? A. Presumably ever since the days of Cellini for his method and so on for the other methods; certainly as long as I have been acquainted with the casting art, which is some 27 years."

Just as, when the thing disclosed by a patentee possesses originality the knowledge and capabilities of men skilled in the art must be looked at to decide whether it possesses also the quality of invention, so in considering infringement of a patent for a meritorious invention the knowledge and capabilities of men trained in the technology of the art must be taken into account. Such men may be trusted to find a variety of physical embodiments

* See 126, f. 377; 131, f. 391; 137, f. 410; 138, f. 414; 145, f. 435.

of the idea of means which is the true substance of the patented invention, embodiments which are the equivalent of what is disclosed and claimed in the patent. In mathematics, this generalization is expressed in the phrase that things which are equal to the same thing are equal to each other. In the patent law, a classic statement of the rule was given by Mr. Justice Clifford in *Machine Co.* v. *Murphy*, 7 Otto 120, 125:

> "Authorities concur that the substantial equivalent of a thing, in the sense of the patent law, is the same as the thing itself; so that if two devices do the same work in substantially the same way, and accomplish substantially the same result, they are the same, even though they differ in name, form, or shape. Curtis, Patents (4th ed.), sect. 310."

We venture the suggestion that this doctrine of equivalents is nothing more than the reflection of the reluctance of sophisticated judges to be hoodwinked by superficial appearances, and their determination in the administration of justice for the public good to look through the form to the substance of things. Looked at in that way, we submit that the use by the alleged infringers of other known types of plastic materials than rubber and of other injection forces than centrifugal force which act upon the melted wax in the same way to produce the same result, is an encroachment upon the true invention described and claimed in Jungersen's patent and is therefore an infringement.

Respectfully submitted,

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Appendix

SCULPTURE TECHNIQUE. ENCYCLOPEDIA BRITANNICA, 14TH ED., VOL. 20, p. 229.

CIRE PERDUE, OR LOST WAX PROCESS.—The first stage of this process, after receiving the model from the artist, consists in preparing a negative made of plaster or gelatine. This is merely a coating of the outside of the model. In this negative, which shows all the details of the model in the reverse, a wax coating is applied in a molten state with a brush until it has acquired sufficient thickness, depending on the size of the figure.

At this stage, we will have a perfect replica of the sculpture in wax, and sufficiently hard to permit handling. The artist can work on it as much as he pleases, obtaining rare results of details, which makes this process of casting invaluable. Gates and vents in the shape of wax rods are then properly attached to the wax figure.

Finally, the mould for the metal is formed by blowing or pouring inside and around the wax a semi-liquid composition, which hardens in a few minutes. This composition of silica, plaster and other chemicals can resist high temperature, and, of course, all the wax inside of it will melt away, leaving a hollow space. This operation is accomplished in large ovens, by baking the moulds over a slow fire. As soon as all the wax is surely melted away, the mould is removed from the oven and packed in foundry earth in a pit provided in the floor. The bronze is then poured from crucibles, and the molten metal will run through the gates (melted away) and fill the space left empty by the wax figure also melted away (lost wax). The figure in bronze is then removed from the silica mould and dipped in acid for a proper cleaning.

With this process, the cast bronzes require very little finishing or chiselling, and the results are far above the sand process.

BRONZE AND BRASS ORNAMENTAL WORK. ENCYCLOPEDIA BRITANNICA, 14TH ED., VOL. 4, p. 240.

BRONZE AND BRASS ORNAMENTAL WORK. The use of bronze dates from remote antiquity. This important metal is an alloy composed of copper and tin, in proportions which vary slightly, but may be normally considered as nine parts of copper to one of tin. Other ingredients which are occasionally found are more or less accidental. The result is a metal of a rich golden brown colour, capable of being worked by casting—a process little applicable to its component parts, but peculiarly successful with bronze, the density and hardness of the metal allowing it to take any impression of a mould, however delicate.

This process is known as *cire perdue*, and is the most primitive and most commonly employed through the centuries, having been described by the monk Theophilus, and also by Benvenuto Cellini. Briefly, it is as follows: A core, roughly representing the size and form of the object to be produced, is made of pounded brick, plaster or other similar substance and thoroughly dried. Upon this the artist overlays his wax, which he models to the degree required in his finished work. Passing from the core through the wax and projecting beyond are metal rods. The modelling being completed, the outer covering which will form the mould has to be applied; this is a liquid formed of clay and plaster sufficiently thin to find its way into every detail of the wax model. Further coatings of liquid are applied, so that there is, when dry, a solid outer coating and a solid inner core held together by the metal rods, with the

work of art modelled in wax between. Heat is applied and the wax melts and runs out, and the molten metal is poured in and occupies every detail which the wax had filled. When cool, the outer casing is carefully broken away, the core raked out as far as possible, the projecting rods are removed and the object modelled in wax appears in bronze. If further finish is required it is obtained by tooling.

(W. W. W.)